REDUCED OIL EMULSION
WITH VISCOSITY-BUILDING EMULSIFIER

FIELD OF THE INVENTION

The present invention is directed to an edible emulsion comprising fibers. More particularly, the invention is directed to a reduced oil emulsion composition comprising insoluble fiber, thickener and a viscosity-building emulsifier. When, for example, the emulsion of this invention is employed to make a reduced oil mayonnaise composition, the resulting reduced oil mayonnaise composition unexpectedly has the taste, viscosity, mouthfeel and appearance of full oil mayonnaise. Moreover, the edible emulsion comprising insoluble fiber, thickener and viscosity-building emulsifier of this invention may, in addition to mayonnaise, be used as a base for dressings, soups, sauces, dips, spreads, fillings, drinks or the like, and for both hot, cold and frozen applications.

BACKGROUND OF THE INVENTION

Edible emulsions are used as a base for many types of food products. Mayonnaise compositions, for example, comprise edible oil-in-water emulsions that typically have between 80 to 85% by weight oil, and egg yolk, salt, vinegar and water. Mayonnaise compositions are enjoyed by many consumers, and particularly, on sandwiches, in dips, with fish and other food applications.

The oil present in the edible emulsions used in such food products is generally present as droplets dispersed in the water phase. In addition to droplet size and the amount of droplets dispersed, the close packing of the oil droplets results in the characteristic rheological behavior of the emulsions used to make the desired food product (e.g., mayonnaise).

Notwithstanding the fact that many consumers enjoy the taste of full fat products, there is an increasing demand for food products prepared from edible emulsions that have less fat and calories than conventional full fat food products.

It is known that attempts have been made to formulate reduced fat and calorie food products, like mayonnaise compositions, but the resulting food products typically do not have the texture and sensorial properties associated with full fat containing products. The inferior texture is invariably related to the reduced levels of oil in the edible emulsions, resulting in food products that lack the sensorial properties of full fat products since reduced fat and calorie products have high levels (i.e., over 3.8% by weight) thickeners like starch and gum in lieu of oil. The replacement of oil with high levels of starch and gum is effective for minimizing calories in food products, but unfortunately causes the food product to be tacky (difficult to dissipate) within the mouth and very dull and opaque looking.

This invention, therefore, is directed to a reduced oil edible emulsion comprising insoluble fiber, thickener and a viscosity-building emulsifier. The edible emulsion of this invention can be used as a base to make a variety of food products, and unexpectedly, results in a food product that has the characteristics of a full fat product when less than the conventional amount of oil is employed. Furthermore, the food products made with the edible emulsion comprising insoluble fiber, thickener and viscosity-building emulsifier of this invention have, in addition to excellent texture and sensorial properties, the added health benefits associated with food products containing fiber. Such food products also have the benefit of being substantially free of carbohydrates; therefore, very desirable to high protein/low carbohydrate dieters.

ADDITIONAL REFERENCES

Efforts have been made for preparing edible emulsions. In U.S. Patent Application No. 2002/0197382 A1, edible oil-in-water emulsions having a reduced content of oil are described.

Other efforts have been made for preparing edible emulsions. In U.S. Patent No. 6,039,998, freezable and low calorie spoonable dressings with fatty acid esterified propoxylated glycerin compositions are described.

Still other efforts have been made for preparing emulsions. In U.S. Patent No. 5,690,981, low calorie foodstuffs are described.

None of the additional information above describes an edible emulsion having reduced oil content, insoluble fiber, thickener and viscosity-building emulsifier whereby the edible emulsion can be used to make a food product with characteristics, including visual characteristics, that are similar to those of food products comprising edible emulsions containing conventional amounts of oil.

SUMMARY OF THE INVENTION

In a first aspect, the present invention is directed to an edible emulsion comprising:

a) oil;
b) water;
c) a viscosity-building emulsifier that at 2.0% by weight is partially or completely not soluble in acidified deionized water having a pH of ≤

about 5.5, or a viscosity-building emulsifier that is at least about 50.0% by weight protein, or both;

d) insoluble fiber; and

e) thickener

wherein the edible emulsion is coarse or smooth and suitable to use as a base for a food product (X) that has substantially the same taste, viscosity and appearance of a food product (X*) having a standard oil content, where X and X* are identical food products and X has at least about 10.0% (preferably, from about 15 to about 35.0%) by weight less oil than X*.

In a second aspect, the present invention is directed to a method for making a reduced oil food product comprising the edible emulsion of the first aspect of this invention.

In a third aspect, the present invention is directed to the reduced oil food product comprising the edible emulsion of the first aspect of this invention.

Oil, as used herein, means triglycerides, and especially, those that are liquids at room temperature. Water, as used herein, means pure water or a solution thereof. Insoluble fiber means fiber suitable for human consumption and not water soluble whereby when the same is supplied as an additive composition, the additive composition is not more than 50% by weight soluble fiber, based on total weight of soluble and insoluble fiber in the additive composition. Edible emulsion with conventional amounts of oil means an emulsion, not in final food product form, suitable for a real mayonnaise base and comprising about 80.0 - 85.0% by weight oil, based on total weight of the edible emulsion. Texture and sensorial properties associated with full fat products means that food products made with the edible emulsions of the present invention unexpectedly have the taste, viscosity, mouthfeel

consistent with full fat products wherein mouthfeel consistent with full fat products means not sticky or tacky as is the case with food products having high levels of starch and gum, such that the same breakdown and dissipate in the mouth in a time and manner similar to that of full fat products. Appearance consistent with full fat products means not opaque and unattractive, but oily-looking

Coarse, as used herein means the insoluble fibers are detectable in the emulsion thereby producing discernible grainy or particle comprising characteristics when in the mouth. Smooth, as used herein, means no discernible grainy or particle comprising characteristics when in the mouth. Partially soluble means not 100.0% dissolved. Viscosity-building means able to increase viscosity by a factor of at least 10.0% in a product when compared to other emulsifiers used in the same product and at the same weight percent. Reduced oil food product, as used herein, means a food product with insoluble fibers and less oil than a food product having the standard oil content (ie., the amount of oil known to be used in a particular food product in the absence of insoluble fibers). Food product, as used herein, means a product ready for consumption and comprising the edible emulsion of this invention. Identical food products mean food product (X) and food product (X*) are food products of the same category, for example, (X) and (X*) may both be mayonnaise compositions or dips. Substantially free of carbohydrates means 3.8% by weight or less, and preferably, between about 2.0 and about 3.5% by weight starch, based on total weight of the food product.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The only limitation with respect to the type of oil used to make the edible emulsion of this invention is that the oil is suitable for human consumption. Illustrative examples of the types of oil which may be used in this invention include, without limitation, those which are liquid at ambient temperature like avocado,

mustard, coconut, cottonseed, fish, flaxseed, grape, olive, palm, peanut, rapeseed, safflower, sesame, soybean, sunflower, mixtures thereof and the like.

Other types of oils which may be used in this invention are solid at ambient temperature. Illustrative examples of the oils which are solid at room temperature and suitable for use in this invention include, without limitation, butter fat, chocolate fat, chicken fat, coconut oil, hydrogenated palm kernel oil, mixtures thereof and the like.

In a preferred embodiment, the oil used in this invention is a liquid at ambient temperature. In a most preferred embodiment, the oil used in this invention is soybean, sunflower or rapeseed oil or a mixture thereof.

The amount of oil used in the edible emulsion of this invention is typically more than about 7.5 weight percent and less than about 85.0 weight percent, based on total weight of the edible emulsion. Preferably, the amount of oil employed in the edible emulsion is from about 15.0% to about 80.0%, and most preferably, from about 20.0 to about 60.0% by weight, based on total weight of the edible emulsion and including all ranges subsumed therein.

The water used in this invention can be pure water, tap water, bottled water, deionized water, spring water, or a mixture thereof. Thus, the water used in this invention may be an aqueous solution comprising salts or minerals or both. Typically, water makes up the balance of the edible emulsion and the food product made with the same.

Regarding the insoluble fibers suitable for use in this invention, such fibers are found, for example, in fruits, both citrus and non-citrus. Other sources of the insoluble fibers suitable for use in this invention are vegetables like legumes, and grains. Preferred insoluble fibers suitable for use in this invention can be recovered

from tomatoes, peaches, pears, apples, plums, lemons, limes, oranges, grapefruits or mixtures thereof. Other preferred insoluble fibers suitable for use in this invention may be recovered from the hull fibers of peas, oats, barley, mustard, soy, or mixtures thereof. Still other fibers which may be employed include those that are plant or root-derived as well as those which are wood-derived. Typically, the edible emulsion of this invention comprises from about 0.10 to about 1.0%, and preferably, from about 0.1 to about 0.75%, and most preferably, from about 0.15 to about 0.50% by weight insoluble fibers, based on total weight of the edible emulsion, and including all ranges subsumed therein. Such insoluble fibers are commercially available from suppliers like J. Rettenmaier and Sohne GMBH under the Vitacel name and Herbstreith & Fox under the Herbacel name. These insoluble fibers typically have lengths from about 25 to about 400 microns, and preferably, from about 50 to 185 microns, and most preferably, from about 100 to about 165 microns, including all ranges subsumed therein. The widths of such fibers are typically between about 3.0 to about 20.0 microns, and preferably, from about 5.0 to about 10.0 microns.

The emulsifier used in this invention is typically a mixture of emulsifiers. The first emulsifier selected usually has an HLB of greater than about 8.0, and preferably, greater than about 11.0, and most preferably, from about 12.0 to about 18.0, including all ranges subsumed therein. Illustrative examples of such an emulsifier suitable for use in the emulsifier mixture employed in this invention include, without limitation, PEG 20 tristearate, PEG 20 trioleate, PEG 20 monostearate, PEG 20 monooleate, PEG 20 monopalmitate and PEG 20 monolaurate sorbitan, derivatives thereof, mixtures thereof and the like, also made available by ICI Surfactants under the names Tween or Span. The preferred emulsifier employable in this invention is, however, a protein, like fruit, vegetable (e.g., pea protein), milk (e.g., whey) or soy protein, or mixtures thereof. Another preferred protein suitable for use in this invention is phospholipoprotein (e.g., phospholipoprotein present in egg yolk, whole egg or enzyme modified egg), and especially, egg yolk derived phospholipoprotein

modified with phospholipase A as disclosed in U.S. Patent No. 5,028,447, the disclosure of which is incorporated herein by reference.

The viscosity-building emulsifier that at 2.0% by weight is partially or completely not soluble in acidified deionized water having a pH of ≤5.5 and the emulsifier that is at least about 50.0% by weight protein (preferably at least about 70.0% by weight protein) are both preferably suitable for human consumption and desired in order to enhance not only the rheological characteristics of the edible emulsion of the present invention but also the appearance of the same.

Illustrative examples of the types of viscosity-building emulsifiers that are partially or completely not soluble in acidified deionized water having a pH of ≤5.5 include, without limitation, those generally classified as caseins. Preferred emulsifiers in this category include an alpha-casein, epsilon-casein, beta-casein, kappa-casein, mixtures thereof or the like. Especially preferred viscosity building emulsifiers suitable for use in this invention are casein salts like potassium caseinate, sodium caseinate, ammonium caseinate, mixtures thereof or the like.

The viscosity building emulsifiers that are at least about 50.0% (and preferably at least about 70.0%) by weight protein and suitable for use in this invention include lactalbumin, lactoglobulins, lactferrin, mixtures thereof or the like. Especially preferred viscosity-building emulsifiers in this class include protein comprising material that is not denatured and suitable to adsorb to oil droplet interfaces within the edible emulsion. Such a viscosity-building emulsifier can be, for example, be animal or plant derived and often becomes partially or completely not soluble in aqueous solutions having a pH below about 2.0. In an especially preferred embodiment, a solution of protein aggregates, like whey protein aggregates, made by first heating a native whey emulsifier to above 70°C at a pH preferably above the isoelectric point (with substantially little to no salt {≤0.1} being present) may be used, where whey protein sold under the Bipro name is the often preferred soluble aggregate precursor.

The total amount of emulsifier employed in the edible emulsion of this invention is typically from about 0.5 to about 12.0%, and preferably, from about 0.5% to about 8.0%, and most preferably, from about 1.5 to about 6.5% by weight emulsifier, based on total weight of the edible emulsion and including all ranges subsumed therein. However, the edible emulsion typically comprises from about 0.1 to about 4.0, and preferably, from about 0.125 to about 3.0, and most preferably, from about 0.15 to about 1.75% by weight viscosity-building emulsifier, based on total weight of the edible emulsion and including all ranges subsumed therein, with the proviso that the amount of chemical emulsifier employed does not exceed the amount of viscosity-building emulsifier.

When making the edible emulsion comprising insoluble fibers of the present invention, emulsifier is typically added to the water, or oil or both water and oil. Likewise, the insoluble fibers may also be added to the water or oil, or both water and oil, either before, during or after the addition of the emulsifier. In a preferred embodiment, the insoluble fibers are added before emulsion formation is completed. The resulting water and oil phases can be mixed in a conventional mixer (e.g., under moderate sheer) to produce an edible coarse emulsion suitable for use as a base for food products. Such a coarse emulsion comprises oil droplets wherein at least about 75%, and preferably, at least about 85.0%, and most preferably, at least about 95.0% of all of the oil droplets present in the coarse emulsion have a diameter that is greater than about 2.5 μm, and preferably, greater than about 5.0 μm, and most preferably, between about 10.0 to about 200.0 μm.

If, on the otherhand, an edible emulsion with a smooth texture is desired, optionally, the coarse edible emulsion may be homogenized in, for example, a high pressure homogenizer. The homogenization step is typically carried out under pressures from about 20.0 to about 650.0 bar, and preferably, from about 40.0 to about 600.0 bar, and most preferably, from about 45.0 to about 550.0 bar, including

all ranges subsumed therein. Typically, such a homogenization step is carried out at a temperature from about 15.0°C to about 70°C (preferably about ambient temperature) and for enough time to produce oil droplets (in the edible emulsion) whereby at least about 80.0% of the total amount of oil droplets in the emulsion have a diameter which is less than about 10.0 μm. In a preferred embodiment, at least about 85.0% of the total amount of oil droplets present in the edible emulsion have a diameter which is less than about 8.0 μm. In an especially preferred embodiment, at least about 95.0% by weight of all oil droplets present within the edible emulsion have a diameter which is less than about 5.0 μm.

The preferred thickeners suitable for use in this invention include conventional food grade starches and gums, and preferably, a mixture of the same. The starches are typically added to water to make a paste comprising about 1.0 to about 15.0% by weight starch, based on total weight of starch and water, including all ranges subsumed therein. At least about 50.0%, and preferably, about 100.0% of the paste is added and mixed in to the edible emulsion after the edible emulsion is has been homogenized. The gum is typically added anytime before or after the emulsion is made and thoroughly mixed within the same.

The Food grade starches that may be used in this invention include modified, non-modified, instant or cook-up starches as well as mixtures of the same. Such starches (e.g., corn, waxy maize, potato, rice, tapioca, wheat or mixtures thereof) are known thickening agents and often made commercially available from suppliers like National Starch and Chemical Company, Corn Products International and E.W. Staley Manufacturing Company. Cook-up starches are the generally preferred starches used in the edible emulsion of the present invention, with SnowFlake cook-up starch from Corn Products International being especially preferred. The amount of starch used in the food products made with the edible emulsion of the present invention is uncharacteristically low and usually from about 0.5 to about 3.5, and preferably, from about 1.0 to about 3.5, and most preferably, from about 2.5 to about 3.5% by weight

starch, based on total weight of the food product, including all ranges subsumed therein.

Illustrative examples of the preferred gums suitable for use in this invention include cellulose, locust bean, xanthan, carrageenan, guar gum, mixtures thereof and the like. Such gums typically make up from about 0.1 to about 0.3% by weight of the total weight of the food product comprising the edible emulsion, including all ranges subsumed therein.

It should be noted that the edible emulsion comprising insoluble fibers disclosed herein preferably has an oil-in-water phase. Thus, it is within the scope of this invention for the edible emulsion comprising insoluble fibers to be a single phase emulsion or a multiple phase emulsion, like a water-in-oil-in-water emulsion.

It is particularly noted herein that if heat treatment, like pasteurization, is not desired, the edible emulsion described herein may be acidified in order to inhibit microbiological growth. When acidified and a viscosity-building emulsifier that at 2.0% by weight is partially or completely not soluble in acidified deionized water having a pH of ≤5.5 is employed, the food product typically has enough acidulant added so that the pH of the same is from about 2.75 to about 5.5, and preferably, from about 2.85 to about 5.50, and most preferably, from about 3.00 to about 4.00, including all ranges subsumed therein. In a preferred embodiment, at least about 50.0% by weight of the acid employed is added after homogenization and in a most preferred embodiment, about 100% of the acid employed is added after homogenization when the viscosity building emulsifier is one that at 2.0% by weight is partially or completely not soluble in acidified deionized water having a pH of ≤ about 5.5.

There is no limitation with respect to the type of acidulant employed in this invention other than that the acidulant is one which may be used in formulations

suitable for human consumption. Illustrative examples of the types of acidulants which may be used in this invention include, without limitation, acetic acid, citric acid, hydrochloric acid, lactic acid, malic acid, phosphoric acid, glucono-delta-lactone, mixtures thereof and the like. In a preferred embodiment, the acidulant employed in this invention is a mixture of hydrochloric or phosphoric acid, and lactic acid, with lactic acid making up no more than about 40.0% by weight of the total weight of the acidulant mixture. It is noted that acidulant may be added before or after the edible emulsion with insoluble fiber is made. In an especially preferred embodiment, however, acidulant is added after the emulsion is made.

It is noted that in lieu of oil or in combination with oil, conventional fat substitutes may be used. Preferred fat substitutes employable in this invention include fatty acid-esterified alkoxylated glycerin compositions as well as sucrose fatty acid esters. The former and latter are described in U.S. Patent Nos. 5,516,544 and 6,447,824, respectively, the disclosures of which are incorporated herein by reference. When employed, such conventional fat substitutes preferably make up at least about 30.0%, and most preferably, at least about 75.0% of the total weight of the oil in the emulsion.

The edible emulsions of this invention may be combined with optional additives to make a food product ready for consumption. Preferred optional additives which may be employed in the food products made with edible emulsion of the present invention include mustard flour, chocolate, nut paste, salt (and other spices and seasonings), vitamins, artificial flavors and colors (e.g., beta carotene) fruit puree, preservatives, antioxidants, chelators, meat like ham and bacon bits or particulates, buffering agents, vegetable bits or particulates, fruit bits or particulates, cheese, mixtures thereof and the like. Such optional additives, when used, collectively, do not make up more than about 40.0% by weight of the total weight of the food product.

When preparing the food product ready for consumption, the optional additives may be added to water and/or oil before the edible emulsion comprising insoluble fiber is made, but preferably the optional additives are mixed in after the emulsion is made (especially when the optional additives are large, like fruit or bacon bits). In a preferred embodiment, the resulting food product made with the edible emulsion comprising insoluble fiber of the present invention comprises less than about 75.0%, and preferably, less than about 55.0%, and most preferably, from about 6.0 to about 35.0% by weight oil, based on total weight of the food product and including all ranges subsumed therein.

The preferred preservatives suitable for use in this invention include sodium benzoate, potassium benzoate, potassium sorbate, sorbic acid, benzoic acid, mixtures thereof and the like. Anti-oxidants suitable for use in this invention include a tocopherol, ascorbic acid, ascorbyl palmitate, tertiary-butyl hydroquinone, mixtures thereof and the like. Chelators suitable for use in this invention include EDTA and its salts, citric acid, sodium tripolyphosphate, sodium carbonate, potassium carbonate, mixtures thereof and the like.

The fruit and vegetable bits that may be used in food products comprising the edible emulsion of this invention are typically small enough to fit through the orifice present in a conventional squeeze bottle. The vegetable bits often include peppers, carrots, cabbage, onion, broccoli, mixtures thereof and the like. The fruit bits often include pears, apples, grapes, tomatoes, mixtures thereof and the like.

The cheese suitable for use in this invention can be skim, part skim or full fat cheese. Typical non-limiting examples of the types of cheese (including processed cheese) suitable for use in this invention include gouda, edam, leyden, cheddar, goat, chesire, stilton, mozzarella, cream cheese, brie, feta, tilsit, mixtures thereof and the like. When cheese is employed to make the food product, it is preferred that the same be melted prior to being added to the edible emulsion or any of its precursor

phases. Often, the final food product will comprise from about 10.0% to about 35.0% by weight cheese.

Still other additives which may be optionally added to the food products of this invention include protein sources and sweeteners. The former include caseinate and skimmed milk powder and the latter include syrups, sucrose, glucose, saccharin, aspartame, dextrose, lactose, levelose, maltose, fructose, mixtures thereof and the like.

The viscosity of the food products made with the edible emulsion comprising insoluble fiber as disclosed herein is typically greater than about 3,000 and less than about 150,000 centipoise. When a sauce or pourable dressing is, for example, the desired food product, the viscosity of the food product is preferably from about 4,000 to about 10,000 centipoise, and most preferably, from about 4,350 to about 6,000 centipoise.

When the desired food product is, for example, a filling, dip or spoonable dressing, the viscosity of the food product is preferably from about 12,000 to about 120,000 centipoise, and most preferably, from about 16,000 to about 80,000 centipoise, whereby the viscosity of the food product is measured on a Haake Rheometer (Rotovisco RV20) at room temperature using a set of concentric cylinders (or bob-in-cup) with a 1 mm gap, the bob having a diameter of 1.0 cm and length of 1.0 cm. The inner cylinder or bob starts rotating from 0 shear and ramps up to a shear rate of 134 sec^{-1} in 542 sec. By way of comparison, the viscosity values refer to the shear rate of 10 sec^{-1}.

The packaging for the food products comprising the edible emulsion of this invention is often a glass jar, food grade sachet or squeezable plastic bottle. Sachets are preferred for food service applications, and a plastic bottle is preferred for domestic use.

The examples which follow are provided to facilitate an understanding of the present invention. The examples are not intended to limit the scope of the claims.

Example 1

Low Oil Mayonnaise food products having the edible emulsion of this invention were made by mixing the following phases:

A.	Ingredient	Percent by Weight**
	Stabilized Egg Yolk (10.0% NaCl)	3.2 - 3.7
	Sugar	2.40 - 3.10
	Salt	2.00 - 2.50
	Flavor	0.08 - 0.13
	Beta Carotene (1.0%)	0.01 - 0.03
	Sodium Caseinate	0.4 - 0.6
	Tap Water	7.0 - 10.0

B.	Ingredient	Percent by Weight**
	Vegetable Oil	29.0 - 35.0

C.	Ingredient	Percent by Weight**
	Citrus fiber*	0.22 - 0.26
	Tap water	5.0 - 8.0

D.	Ingredient	Percent by Weight**
	Tap water	Balance

E.	Ingredient	Percent by Weight**
	Vinegar (12%)	1.8 - 2.2
	Lactic acid (50%)	0.18 – 0.26
	Phosphoric Acid (85%)	0.05 - 0.07
	Xanthan gum	0.1 - 0.3
	Modified starch	2.5 - 3.5

* AQ + F Plus, as made commercially available by Herbstreith & Fox

** Percent by weight of food product

Phases (A) through (D) were combined and mixed under moderate shear, at atmospheric pressure and ambient temperature in a conventional mixer to produce a coarse emulsion. The coarse emulsion was then subjected to a homogenizer (e.g., APV Gaulin Homogenizer) pressurized to about 200 bar and at about 20°C. The resulting smooth emulsion was combined with the acidulant mixture of phase (E), mixed well under moderate shear and filled into glass jars:

The resulting low oil mayonnaise compositions had viscosities of about 25,000 centipoise and pH values of about 3.4

Example 2

Low mayonnaise food products similar to those made in Example 1 were tested for surface shine, visible firmness, viscosity and rate of dissipation as follows:

Fifteen (15) trained panelists were given 2.0 ml samples of commercially available Real Mayonnaise (75-80% by weight oil), commercially available light mayonnaise (32-37% by weight oil), and the low oil mayonnaise (30% by weight oil) made with the edible emulsion of the present invention. The samples were tasted and

mouths were rinsed with water between each sample. The panelists were also given jars of the above-identified mayonnaise types in order to assess visual appearances.

	Real Mayonnaise	Light Mayonnaise	Low Oil Mayonnaise
Surface shine	11.47	10.57 s.d.	11.49
Visible firmness	10.45	11.45 s.d.	10.13
Viscosity	8.37	9.00 s.d.	12.10
Rate of dissipation	12.21	11.49 s.d.	12.10

s.d. indicates significant statistical differences versus real mayonnaise and the low oil mayonnaise of this invention. The results unexpectedly show that food products, like low oil mayonnaise compositions, unexpectedly look, taste and have a mouthfeel similar to that of real (full-fat) mayonnaise and significantly better than conventional light mayonnaise products.